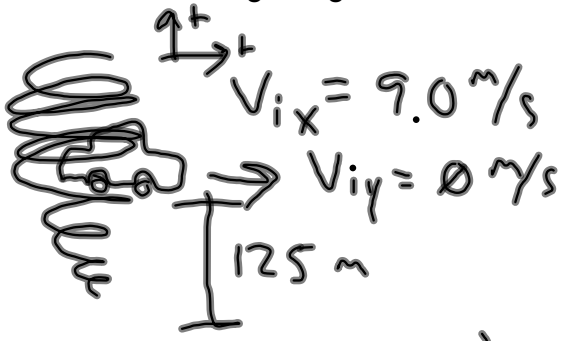
During a thunderstorm, a tornado lifts a car to a height of 125 m above the ground. Increasing in strength, the tornado flings the car horizontally with a speed of 9.0 m/s. How long does the car take to reach the ground? How far horizontally does the car travel before hitting the ground?



$$\Delta y = \cancel{V_{iy} t}^{0} + \frac{1}{2} a_y t^2$$

$$t = \sqrt{\frac{2\Delta y}{a_y}}$$

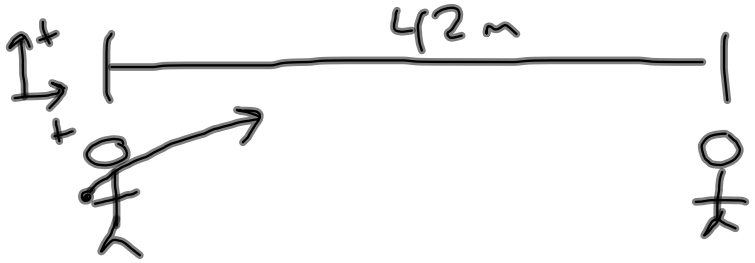
$$= 5.05\ s$$

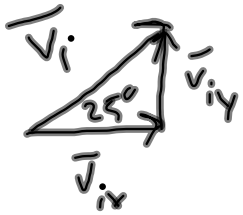
$$\Delta x = V_{ix} t + \cancel{\frac{1}{2} a_x t^2}^{0}$$

$$= (9.0\ m/s)(5.05\ s)$$

$$= 45.5\ m$$

A baseball is thrown at an angle of 25 degrees relative to the ground at a speed of 23.0 m/s. If the ball was caught 42.0 m from the thrower at the same height it was thrown, how long was it in the air? How high above the thrower did the ball travel?





$\Delta x = 42\ m$

$v_{ix} = 20.85\ m/s$

$v_{iy} = 9.72\ m/s$

$$\Delta x = v_{ix} t$$

$$t = \frac{\Delta x}{v_{ix}} = \frac{42.0\ m}{20.85\ m/s} = 2.01\ s$$

$v_{fy} = 0\ m/s$ @ highest point

$$v_{fy}^2 = v_{iy}^2 + 2a_g \Delta y \quad (v_{fy} = 0)$$

$$\Delta y = \frac{-v_{iy}^2}{2a_g} = \frac{-(9.72\ m/s)^2}{2(-9.8\ m/s^2)} = 4.82\ m$$